

CLAIMS

5 1. A method for producing nuclear fuel pellets of the MOX (mixed plutonium and uranium oxide) type, comprising the steps of

- preparing an U-Pu oxide blend powder having a Pu content in excess of the finally desired value,
- 10 - preparing an uranium oxide powder,
- mixing adequate quantities of both powders in order to achieve the desired plutonium content,
- compacting and sintering the mixture for obtaining said pellets,

15 characterized in that the step of preparing the uranium oxide powder involves the following sequence of substeps:

- a) preparation of an aqueous solution of uranyl nitrate to which between 0.5 and 2 wt% of organic thickeners are added such that the viscosity of the solution is adjusted to values between 20 and 100 centipoise,
- 20 b) dispersion of the solution into droplets,
- c) introducing said droplets into a hydroxide bath,
- d) washing the resulting beads,
- e) drying the beads by azeotropic distillation using an immiscible organic solvent,
- 25 f) thermal treatment of the beads in an oxidising atmosphere,
- g) thermal treatment in a reducing atmosphere.

30 2. A method according to claim 1, characterized in that the step of preparing an U-Pu oxide blend powder consists in milling and mixing adequate quantities of uranium oxide and plutonium oxide.

35 3. A method according to claim 1, characterized in

that the step of preparing the U-Pu oxide blend powder involves the following sequence of substeps:

a) preparation of an aqueous solution of uranyl-plutonium nitrate to which small amounts of organic thickeners are added in order to adjust the viscosity of the solution to values between 20 and 100 centipoise,

b) dispersion of the solution into droplets,

c) introducing said droplets into a hydroxide bath,

d) washing the resulting beads,

e) subjecting the beads to an azeotropic distillation using an immiscible organic solvent,

f) thermal treatment of the beads in an oxidising atmosphere,

g) thermal treatment in a reducing atmosphere.

4. A method according to anyone of the preceding claims, characterized in that in substep a) the organic thickeners are selected among methocel, dextran and polyvinyl alcohol.

5. A method according to anyone of the preceding claims, characterized in that in substep c) the hydroxide bath consists of ammonia.

6. A method according to anyone of the preceding claims, characterized in that in substep f) the thermal treatment in an oxidising atmosphere is performed at about 400°C and in air.

7. A method according to anyone of the preceding claims, characterized in that in substep g) the thermal treatment in a reducing atmosphere is performed at about 800°C, the reducing atmosphere containing an inert gas with a hydrogen content between 1 and 6%.

8. A method according to anyone of the preceding claims, characterized in that compacting of the powder mixture into pellets is obtained by applying a pressure of between 200 and 600 MPa.

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9. A method according to anyone of the preceding claims, characterized in that the sintering of the pellets takes place at a temperature above 1200°C, preferably between 1600 and 1700°C, and in a humidified Ar/H₂ atmosphere, the hydrogen content lying between 1% and 6% and the ratio between the partial pressures of hydrogen and water vapour being selected between 20 and 60.

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10. A method according to anyone of the preceding claims, characterized in that before mixing adequate quantities of both powders, the UO₂-powder is sieved in order to retain only beads with diameters between 20 and 50µm size.

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